combustible gas. In order that the latter may burn it must be mixed intimately with the oxygen; this requires a certain period of time, and the mixture must be made at a temperature sufficiently high to permit the gases to react upon each other.

In steam-boiler settings, an arch of refractory materials is frequently built over the fire. But if this arch does not form a pocket in which the hot gases may accumulate and remain for a time, the unburned gases will flow too rapidly from beneath the arch, and the effect of the arch will be only imaginary. The work of Professor Groume-Grjimailo is filled with similar examples, with complete information regarding the works in which the observations were made. This work is not, therefore, purely theoretical; it is a thoroughly practical treatise based upon actual observations and experiments.

Not content with having developed these new ideas, the author has endeavored to place them before his readers in a manner which will make them absolutely clear, just as he has been doing for a long time in the instruction of his classes. In order to present in a visible manner the circulation of the hot gases within the furnace, he has employed small models of furnace sections, enclosed between two plates of glass, and within these models he has arranged to circulate .two liquids of different densities, water serving as the heavier liquid and colored kerosene as the lighter liquid, representing the hot gases or flame. The localization of the current of kerosene shows very clearly whether the furnaces are of poor design or not. This method is particularly applicable for presenting this subject before those who may not be well informed regarding the technical principles of the great industries; but it has the inconvenience of giving, to a certain extent, an erroneous view of the actual phenomena. During its

circulation, the colored kerosene cannot be changed into water or mixed with it, while the light or hottest gases, having given up their heat, are transformed into colder and heavier gases. This introduces very essential differences which must be clearly understood. The only purpose of this method of representation is to present to the eye a very strong impression which will stimulate the imagination; in practical application it is necessary that we consider these phenomena as they really occur and study the gas itself, which can only be conceived in the abstract and of which no visible representation can be made.